



Mini Review

Volume 13 Issue 4- August 2019
DOI: 10.19080/JDVS.2019.13.555866

Dairy and Vet Sci J

Copyright © All rights are reserved by Guagliardo Silvia Elizabeth

Heavy Metal Bioaccumulation by Cestode Parasites of *Mustelus Schmitti* (Chondrichthyes: Carcharhiniformes), from the Bahía Blanca Estuary, Argentina

Tammone Santos A¹, Schwerdt C², Tanzola R² and Guagliardo S^{2*}¹Departamento BByF, Universidad Nacional del Sur, Argentina²INBIOSUR-CONICET; Departamento BByF, Universidad Nacional del Sur, Argentina

Submission: August 29, 2019; Published: September 06, 2019

*Corresponding author: Guagliardo Silvia Elizabeth. San Juan 670(Universidad Nacional del Sur) CP: 8000 Bahía Blanca. Province Buenos Aires. Argentina

Abstract

The environment of the Bahía Blanca estuary is considered a hot spot in terms of pollution. Bioindicators should have the ability to react relatively fast to certain pollutants and environmental disturbances. Therefore, an exploratory study was carried out determining and quantifying the concentrations of cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb) and zinc (Zn) in the muscle and liver of *Mustelus schmitti* narrownose smooth-hound and were compared with the values obtained from their respective helminth assemblies. In most of the fishes analyzed, the concentration of heavy metals was higher in the infra communities of cestodes compared to the host. Our results position the cestodes as efficient sentinel species of pollution by bioaccumulating higher concentrations of heavy metals than the host tissues, thus behaving in excellent early warnings of environmental pollution, more real than quantifications in sediments, in water and fish.

Keywords: Heavy metals; Bioaccumulation; Sentinels parasites

Introduction

The estuary of Bahía Blanca (39° 03'44 " S 62° 04'00 " W) is an adequate environment to develop pollution studies, considering that it is an area that includes urban centers, several industrial parks and deep-water ports. All the effluents are discharged with different degrees of pretreatment, so they generate different impacts on the ecosystem. In environmental monitoring to detect heavy metals, organisms are often used as bioindicators, which have the ability to react relatively fast to certain toxic products and environmental disturbances. Some of these organisms, such as parasites, may be highly sensitive to brief exposures, poorly detected in water, sediment or fish [1-5]. Our previous studies in the estuary have focused on evaluating the parasitism of fish in the time scale to be able to compare and analyze them as effect indicators altering some parasites population parameter such as prevalence and abundance or causing symptoms in their hosts in response to environmental disturbances [6-10]. The narrownose smooth-hound *Mustelus schmitti* Springer, 1939 is a resident fish of the estuary of Bahía Blanca and third in importance as a fishing resource. Based on the fact that some parasites, such as cestodes, have the ability to absorb and accumulate more chemicals than their host tissues [11].

The objective of the present study was to analyze whether a higher concentration of metals in the parasites respect to their host was applicable in the cestodes- narrownose smooth-hound model and to evaluate if these helminths possess ecotoxicological value and could be used in the study area as early bioindicators of anthropic impact. Therefore, an exploratory study was carried out in order to determine and quantify the cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb) and zinc (Zn) concentrations in the muscle and liver of the narrownose smooth-hound and compared with the values obtained from their respective cestode assemblages (*Dollfusiella* sp., *Orygmatobothrium schmittii*, *Calliobothrium australis* and *Symcallio* sp.) The samples were analyzed by Inductive Coupling Plasma Atomic Emission Spectrometer (ICP-AES, LANAQUI-CERZOS-CONICET-UNS). The values were compared with the limit values allowed by the European Union for fish meat.

Results and Discussion

In most of the fishes analyzed, the concentration of heavy metals was higher in the infra communities of cestodes compared to each host. The parasites concentrated 270 times more Cadmium than the fish muscle. For this metal, the standards established in

the liver and those of the parasites were exceeding the limits established by the European Union for muscle or liver. Chromium was bioconcentrated in the cestodes two times more than the muscle and six times more than the liver. Copper was accumulated with values 65 times more than muscle and up to four times more than in the liver. Lead had values 48 times more in helminths than both muscle and liver of fishes. For this metal in most dosages, the concentration measured in parasites exceeded the limit value established by the European Union. Zinc bioaccumulated in parasites seven times more than muscle and four times more than liver. Only in one case the Zinc concentration was three times higher in the liver than in parasites.

The environment of the Bahía Blanca estuary is considered a hot spot in terms of pollution and is included among the most eutrophic coastal ecosystems known [12]. Also, since many years it have been reported high concentrations of heavy metals and pesticides in water and sediments [13,14]. The combined effect of these pollutants, plus the sewage discharge, the industrial effluents of petrochemical origins, and the overheated water from a thermoelectric power station (620MW) all of them represent a growing threat to the environment. These increase in anthropogenic activity around estuaries, coupled with the persistence of heavy metals, their high toxicity, strong tendency to bioaccumulate, and non-degradability [15], usually affect water. As negative effects it could change the trofic web in the aquatic fauna, eliminate the spawning and larval recruitment sites and a potential decrease in diversity, affecting all the ecosystem [16,17]. That is why the need to choose of efficient bioindicators in the evaluation of the quality of the environment [18].

Conclusion

The estuary of Bahía Blanca is one of the most important in Argentina, having the main deep-water port system in the country. Although fish species can be used as efficient and useful bioindicators, our results position cestodes parasites as sentinel species of contamination for the fact that reported higher concentrations of heavy metals than their hosts. This would avoid possible underestimations in pollution levels by being quantified only in sediments, in water and in fish.

Conflict of Interest

The authors declare that no economic or other interest conflict exist.

References

- Sures B (2008) Host-parasite interactions in polluted environments. J Fish Biol 73(9): 2133-2142.
- Tekin-Özan S, Barlas M (2008) Concentrations of heavy metals in *Ligula intestinalis* L 1758 plerocercoids (Cestoda) compared to it host's (*Tincatinca* L., 1758) organs from Beyşehir Lake (Turkey). Helminthologia 45(2): 76-80.
- AlKallak S (2013) A comparative study of accumulation of Cadmium and Lead in the tapeworm *Postgangesia inarmata* (De Chambrier; Alkallak; Mariaux, 2003) and some Tissues of the Catfish *Silurus glanis* in the Governorate of Nineveh, North Iraq. Damascus University J Basic Sciences, 29(1): 77-89.
- Yen Nhi T, Mohd Shazili N, Shaharom-Harrison F (2013) Use of cestodes as indicator of heavy-metal pollution. Exp Parasitol 133(1): 75-79.
- Golestaninasab M, Malek M, Roohi A, Karbassi A, Amoozadeh E, et al. (2014) A survey on bioconcentration capacities of some marine parasitic and free-living organism in the Gulf of Oman. Ecol Indic 37: 99-104.
- Tanzola R, Guagliardo S, Brizzola S, Arias M, Botté S (1998) Parasite assemblage of *Sympterygia bonapartei* (Pisces: Rajidae), an endemic skate of the Southwest Atlantic. Helminthologia 35(3): 123-129.
- Tanzola R, Guagliardo S (2000) Helminth fauna of the Argentine conger, *Conger orbignyanus* (Pisces: Anguilliformes). Helminthologia 37(4): 229-232.
- Tanzola R, Guagliardo S, Galeano N, Schwerdt C, González R (2006) *Ceratomyxa elegans* Jameson, 1929 (Myxozoa: Ceratomyxidae) parásito de peces batracoididos en el Mar Argentino. Nat Neotrop 6: 16.
- Acebal F, Guagliardo S, Schwerdt C, Galeano N, Paolillo M, et al. (2011) Digeneos parásitos de *Porichthys porosissimus* (Teleostei: Batrachoididae) en el estuario de Bahía Blanca. Bio Scriba 4(1): 26-37.
- Ubrig R, Galeano N, Schwerdt C, Mas J, Sartuqui J, et al. (2013) Utilización de centros pigmentarios de *Sympterygia bonapartei* (Chondrichthyes, Rajidae) como herramienta bioanalítica de contaminación. Frente Marit 23: 303-322.
- Al-Hasawi Z (2019) Environmental Parasitology: intestinal helminth parasites of the siganid fish *Siganus rivulatus* as bioindicators for trace metal pollution in the Red Sea. Parasite 26: 12.
- Freije R, Marcovecchio J (2004) Oceanografía Química En: Ecosistema del estuario de Bahía Blanca. In: Piccolo MC, Hoffmeyer MS (Eds.), Instituto Argentino de Oceanografía. Bahía Blanca, Argentina, pp. 233.
- Villa N, Pucci A (1987) Seasonal and spatial distribution of copper, cadmium and zinc in sea water of Blanca Bay. Estuar Coast Shelf Sci 25: 67-80.
- Sericano J, Zubillaga H, Pucci A (1984) Behaviour of hexachlorocyclohexane isomers and Zn, Cu and Cd in the freshwater mixing area, En: Ecosistema del estuario de Bahía Blanca. In: Piccolo MC, Hoffmeyer MS (Eds.), Instituto Argentino de Oceanografía. Bahía Blanca, Argentina, pp. 233.
- Pekey H (2006) Heavy metal pollution assessment in sediments of the Izmit Bay, Turkey. Environ Monit Assess 123(1-3): 219-231.
- López-Rojas H, Bonilla-Rivero A (2000) Anthropogenically induced fish diversity reduction in Lake Valencia Basin, Venezuela. Biodiver Conserv 9(6): 757-765.
- Whitfield A, Elliott M (2002) Fishes as indicators of environmental and ecological changes within estuaries: a review of progress and some suggestions for the future. J Fish Biol 61(sA): 229-250.
- Viana A, Lucena Frédou F, Frédou T, Torres M, Bordalo A (2010) Fish fauna as an indicator of environmental quality in an urbanized region of the Amazon estuary. J Fish Biol 76(3): 467-486.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/JDVS.2019.13.555866](https://doi.org/10.19080/JDVS.2019.13.555866)

**Your next submission with Juniper Publishers
will reach you the below assets**

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission
<https://juniperpublishers.com/online-submission.php>